

Pre-Operative Cardiac Evaluation

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Cardiac evaluation is an integral part of pre-op evaluation. Perioperative cardiac events are common causes of mortality. Major cardiac complications associated with surgery include cardiac death, MI, CHF and arrhythmias.¹ The goal of the pre-operative evaluation is to discover and treat undiagnosed, unstable cardiac disease and ensure optimal treatment of known disease in order to minimize the probability of cardiac complications. It is frequently the only time some patients will receive a thorough history and physical examination (H&P).

The initial step in any pre-op evaluation is a thorough history and physical. The H&P should focus on identifying any cardiac pathology, establishing its severity, stability, prior treatments and objective assessments such as EKG, stress test, echocardiography and cardiac catheterization. An inquiry should be made regarding other cardiac risk factors such as age, functional capacity, and comorbid conditions like hypertension, diabetes, hyperlipidemia, and tobacco abuse.²

Goldman in 1977 developed a set of criteria to identify the factors increasing peri-operative risk. The criteria were the result of a prospective study of 1001 patients undergoing general, orthopedic, urologic, gynecologic and vascular surgery.^{1,3} He developed a multifactorial index (table 1) which gave certain points to different factors based on their importance in predicting post-op complications.

Table 1:

<u>Criteria</u>	<u>Points</u>
S ₃ gallop or jugular venous distention	11
MI within past 6 months	10
More than 5/min of PVCs	7
Rhythm other than sinus	7
Age over 70 years	5
Emergency surgery	4
intrathoracic, intraperitoneal or aortic site of surgery	3
Important valvular aortic stenosis	3
Poor general medical condition	3

From Goldman, et al.³

In the study, congestive heart failure and myocardial infarction (MI) within the past 6 months emerged as important risk factors for perioperative cardiac complications. The risk of reinfarction is approximately 30% if surgery is performed within 3 months of an MI; drops to 15% at 3-6 months after MI, and reaches that of the normal population after 6 months.¹

While useful in assessing perioperative risk in patients with low to moderate risk of coronary artery disease, the Goldman criteria have not been as accurate in assessing perioperative risks in patients at high risk for CAD, such as those undergoing surgery for peripheral vascular disease. Eagle identified five clinical variables to be predictors of cardiac events in patients undergoing vascular surgery: 1) history of ventricular arrhythmia; 2) presence of Q-waves on EKG; (3) history of diabetes; (4) age>70; and (5) history of angina.^{2,4} The presence of 3 or more clinical variables placed patient at high risk for peri-operative complications.

The EKG is an important tool to investigate coronary artery disease preoperatively. It is generally recommended in almost everyone except that it may not be needed in healthy young patients undergoing low risk surgery. EKG findings that may indicate higher risk patients include: 1) left ventricular hypertrophy; 2) Q-waves; 3) >5 premature ventricular contractions; and 4) rhythm other than sinus.¹

In all cases the decision to perform additional testing such as stress testing and cardiac catheterization must follow a careful assessment of potential risks and benefits to the patients. The assessment of risks should include delaying the surgery vs. the risks of procedures themselves. Evaluation should also be based on patient's goal for the future and willingness to accept future therapy based on the results of such tests. In light of such an assessment, a reasonable recommendation for preoperative cardiac testing can be derived from the American Heart Associations guidelines for peri-operative cardiac risk assessment.

There are 4 main components to the assessment: urgency of surgery, presence of clinical predictors of increased cardiac risk based on H&P and EKG, a detailed assessment of functional capacity (see Table 2)², and a knowledge of the generally accepted procedural risk of the surgery.⁵ The surgeries that are considered to have high risk include any surgery where there is large blood loss and/or fluid shift involved as in the case of aortic and

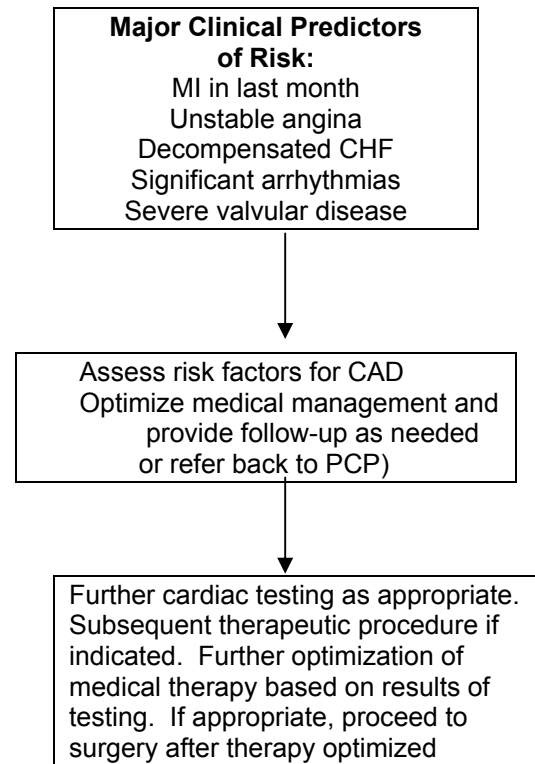
major vascular surgery, cardiothoracic surgery and emergent surgery.⁵ Basic energy requirements for activities and my own simplified algorithm for determining the need for further cardiac testing is given below:

Table 2: Estimated Energy Requirements

1 MET ↓ ↓ ↓ ↓ ↓ 4METS	Can you take care of yourself? Eat, dress, use the toilet? Walk indoors around the house? Walk a block or two on level ground at 2-3 mph? Do light work around the house like dusting or washing dishes?
4METS ↓ ↓ ↓ ↓ ↓ >10METS	Climb a flight of stairs or walk up a hill? Walk on level ground at 4 mph? Run a short distance? Do heavy work around the house like scrubbing floors, lifting or moving heavy furniture? Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis or throwing a baseball or football? Participate in strenuous sports like swimming, singles tennis, football, baseball or skiing?

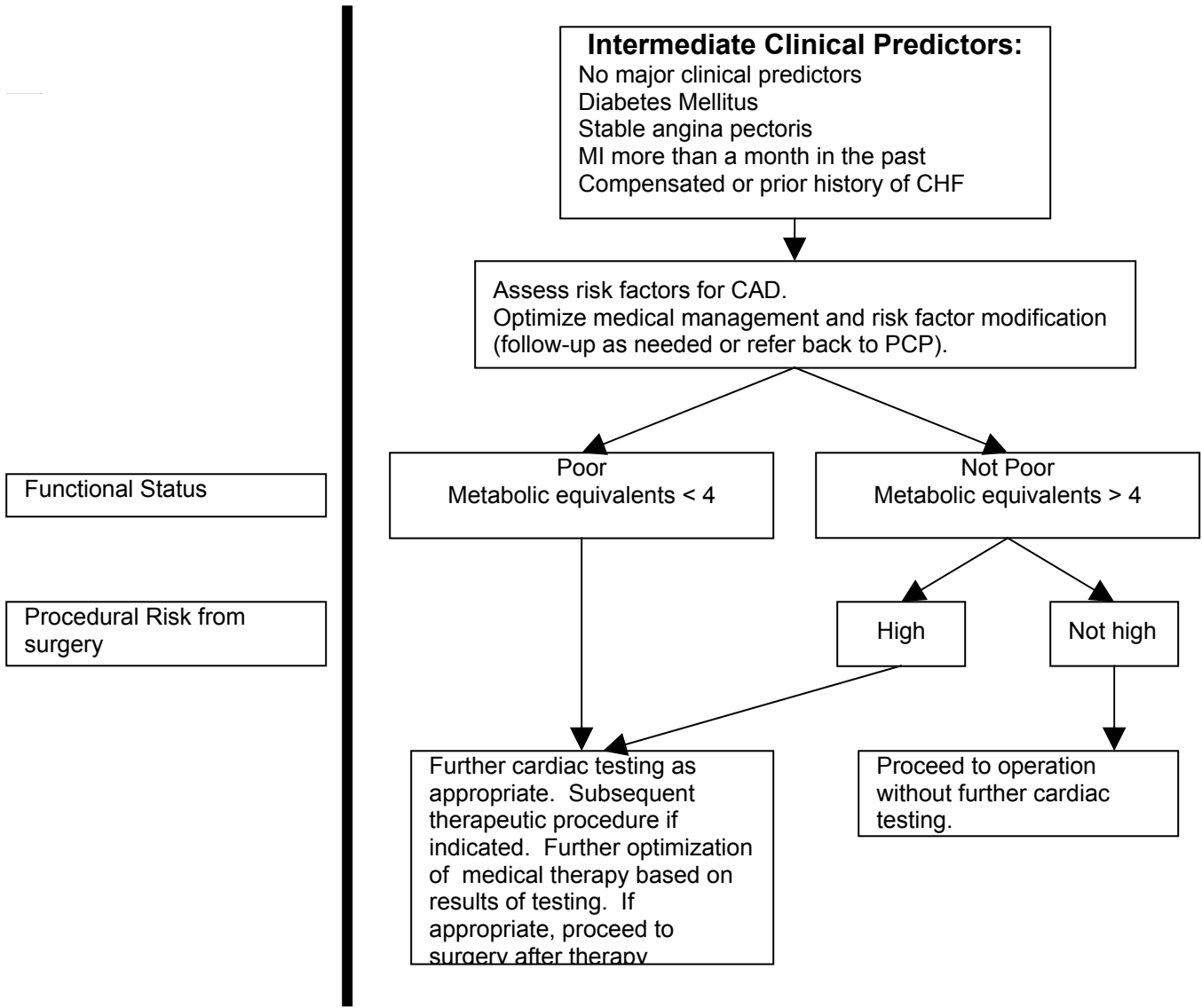
Major Risk:

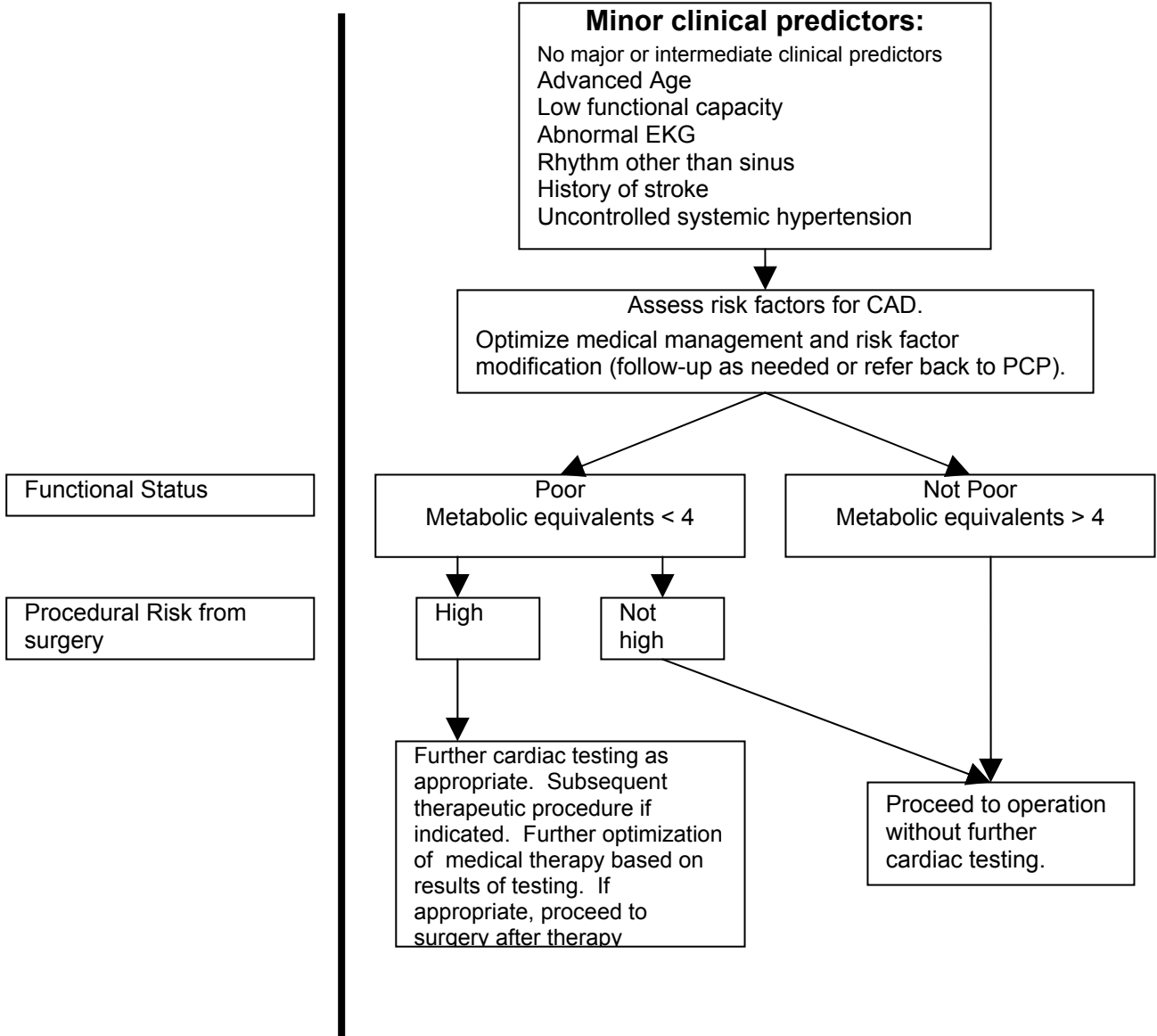
If major clinical predictors of risk are present:



Intermediate Risk

American Heart Association guidelines recommend a stress test for all intermediate clinical predictors with poor functional capacity and for also for those with good functional capacity as long as they are going for a high risk surgery. Further management is based on the stress results. If the results of the test are low risk, for example a fixed defect or a low-grade defect with partial reversibility, further interrogation should be done about the patient's symptoms. If the symptoms are stable, no further testing is needed. The patient can proceed to surgery. On the other hand, if the test shows a large high-grade defect with reversibility, the patient should receive further testing, usually in the form of cardiac catheterization. However, in some instances catheterization might not be feasible even if the stress test is positive e.g. if the patient's creatinine is elevated. At that time, further injury to the kidney secondary to dye vs. the need for catheterization has to be re-evaluated and discussed with the patient.





Minor Risk

Most of the patients in this category are able to proceed directly to surgery without the need for further testing. Further testing might be beneficial in patients with poor functional capacity undergoing high-risk surgery.

In general cardiac catheterization is indicated for patients with high-risk results during noninvasive testing, angina unresponsive to medical therapy, unstable angina and nondiagnostic or equivocal noninvasive test in a high-risk patient undergoing a high-risk noncardiac surgical procedure.²

I have provided certain clinical scenarios below in order to illustrate the importance of the algorithm above.

Q:- A 60 year old male with a history of MI in the remote past who is able to climb up a flight of stairs now presents for right femoral tibial bypass. Preoperative consultation is requested.

A:- This patient has an intermediate clinical predictor as he had an MI in the past. We need to follow the algorithm for intermediate clinical predictors. He apparently has good functional capacity. The next question to ask is the type of surgery patient is undergoing. Because he is undergoing a vascular procedure, which is a high-risk surgery, he should undergo further cardiac testing in the form of stress test prior to surgery.

Q:-An 80-year-old female with a history of unstable angina presents with non life-threatening fracture. What should be done?

A:-We need to follow the algorithm for major clinical predictors because this patient has a history of unstable angina. Optimize medical management and assess the need for further cardiac testing in the form of cardiac catheterization.

Q:- A 75yo male with no medical problems lives in a nursing home. He is unable to perform daily activities of living due to dementia. He fell and broke his femur requiring surgery. The patient appears perfectly healthy with a normal physical examination and EKG. Should the surgery proceed?

A:-This patient's advanced age places him at a minor risk for surgery. His poor functional capacity may put him at increased risk due to debilitation. However, because he is undergoing an intermediate risk procedure, it is okay to proceed with surgery.

Summary

The preoperative evaluation of a patient should consist of a thorough clinical examination and judicious selection of tests based on determinations of risks, functional capacity, type of surgery and the urgency of surgery. If the surgery is emergent, surgery may need to proceed despite other factors. However, if the patient has significant cardiac disease that requires treatment and surgery can be delayed, the patient's underlying cardiac disease should be treated as in a non-operative setting. For patients at minor risk for cardiac disease, generally no further testing is necessary and the patient can proceed directly to surgery. For high-risk patients, further cardiac testing is needed depending on the patient's underlying cardiac disease. For instance, if a patient has a history of symptomatic arrhythmias, he or she might need further electrophysiological study prior to elective surgery. In each instance, benefits and risks of doing additional testing vs. proceeding directly to surgery should be evaluated and discussed with the patient.

References

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